# Nuclear parton densities at the EIC

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# outline

- a quick reminder
- before an EIC
- the EIC era
- summary

a quick reminder: what is she talking about?

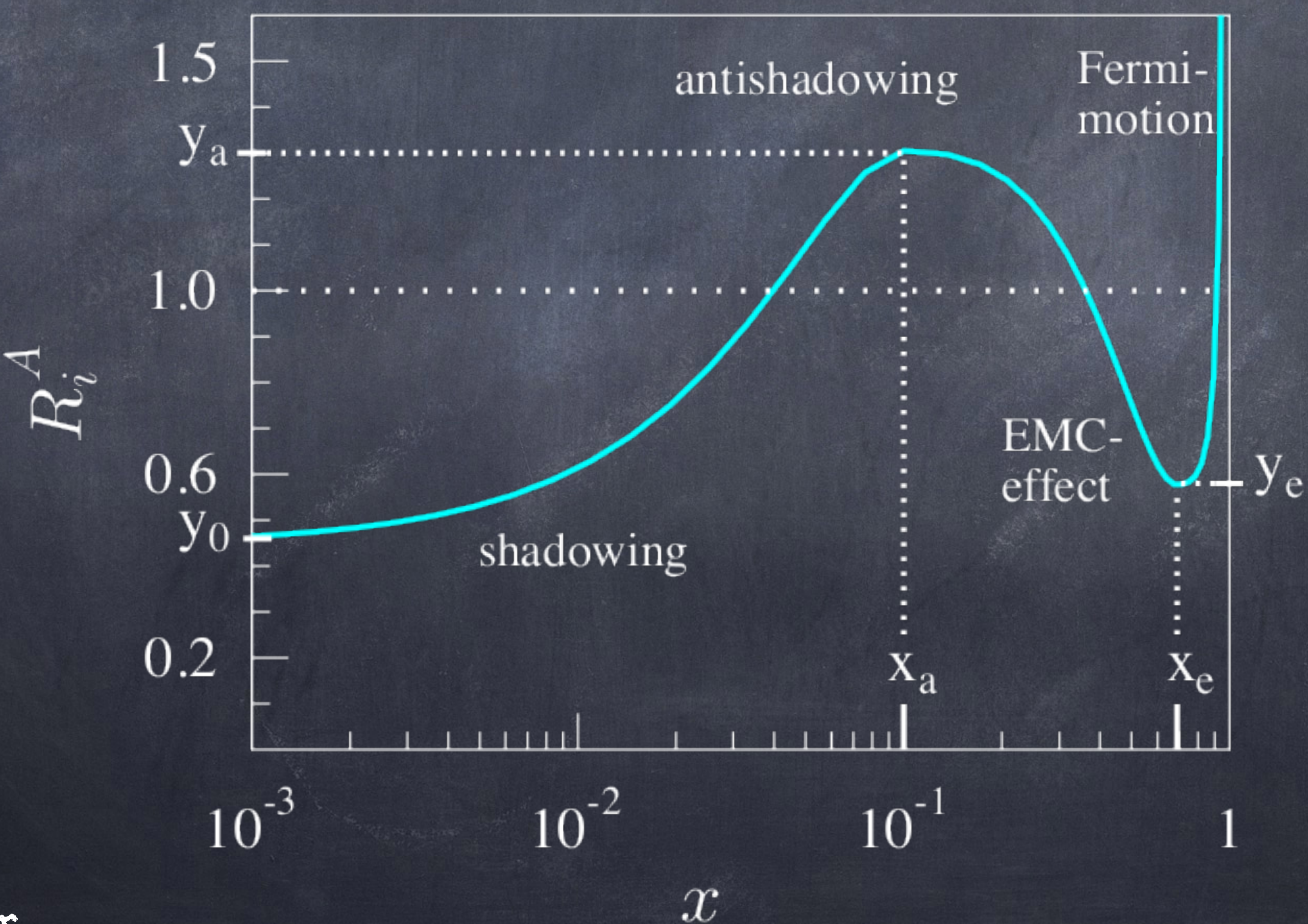
# nPDF: $f_i^A(x,\mu)$

- at LO: probability of finding the parton i in the nucleus A, carrying a fraction x of its momentum, when the nucleus is probed with scale $\mu$
- non-perturbative but universal
- obtained by global fits to the world data

a quick reminder

the procedure: parameterize the nuclear-to-proton PDF ratio at initial scale $Q_0$

$$f_i^{p/A}(x, Q_0) = f_i^p(x, Q_0) R_i^A(x, Q_0, A)$$




a quick reminder

# the observable:

$$\sigma_{red} = F_2 - \frac{y^2}{1+(1-y)^2} F_L$$

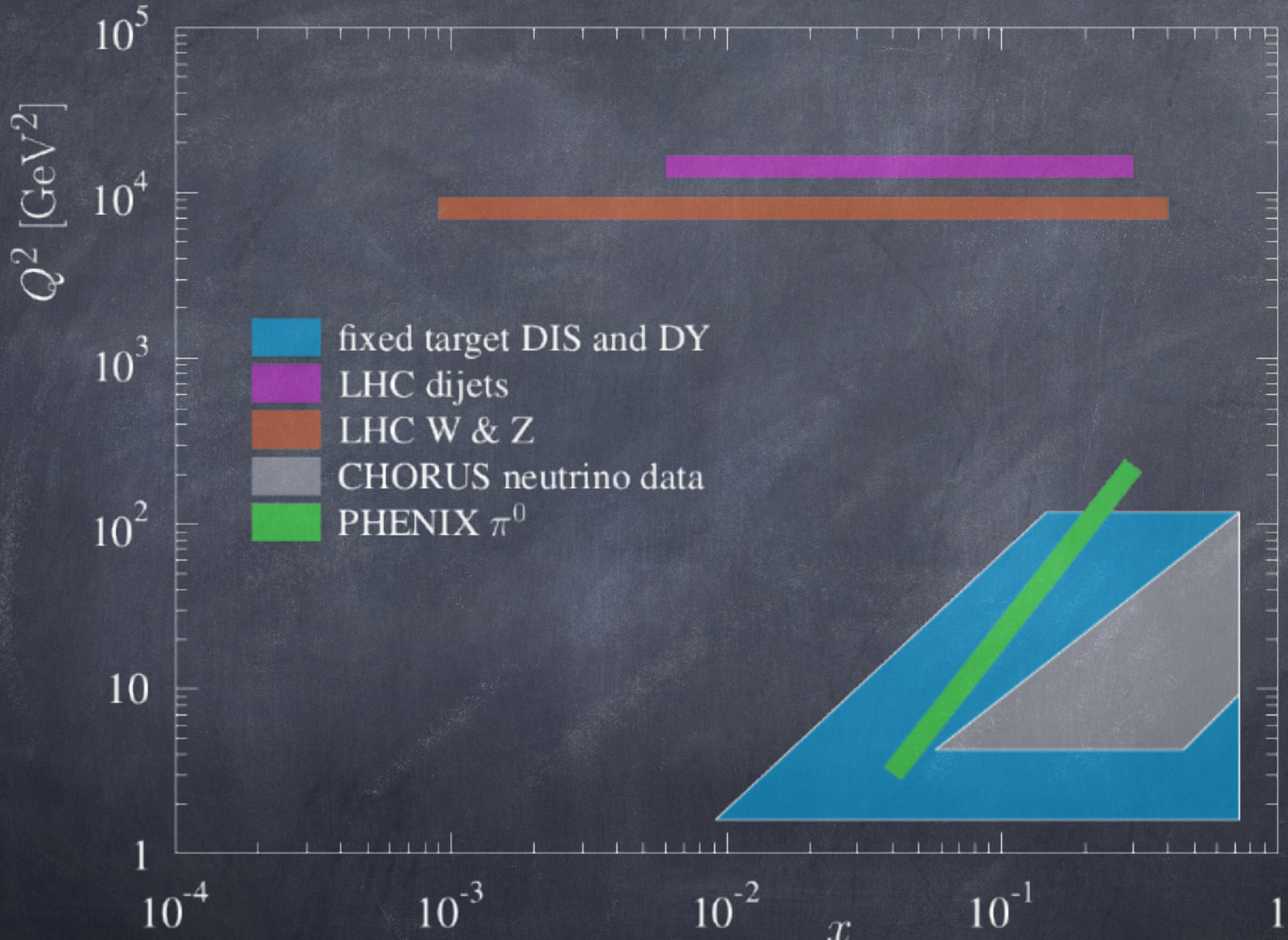
$$F_2^{NLO} = \sum_i^{N_f} e_i (q_i + \bar{q_i}) \otimes \left[ \delta(1-x) + \alpha_s C_{2,q}^{(1)} \right] + \alpha_s \; g \otimes C_{2,g}^{(1)}$$

$$F_L^{NLO} = \alpha_s \left[ \sum_i^{N_f} e_i (q_i + \bar{q_i}) \otimes C_{L,q}^{(1)} + g \otimes C_{L,g}^{(1)} \right]$$

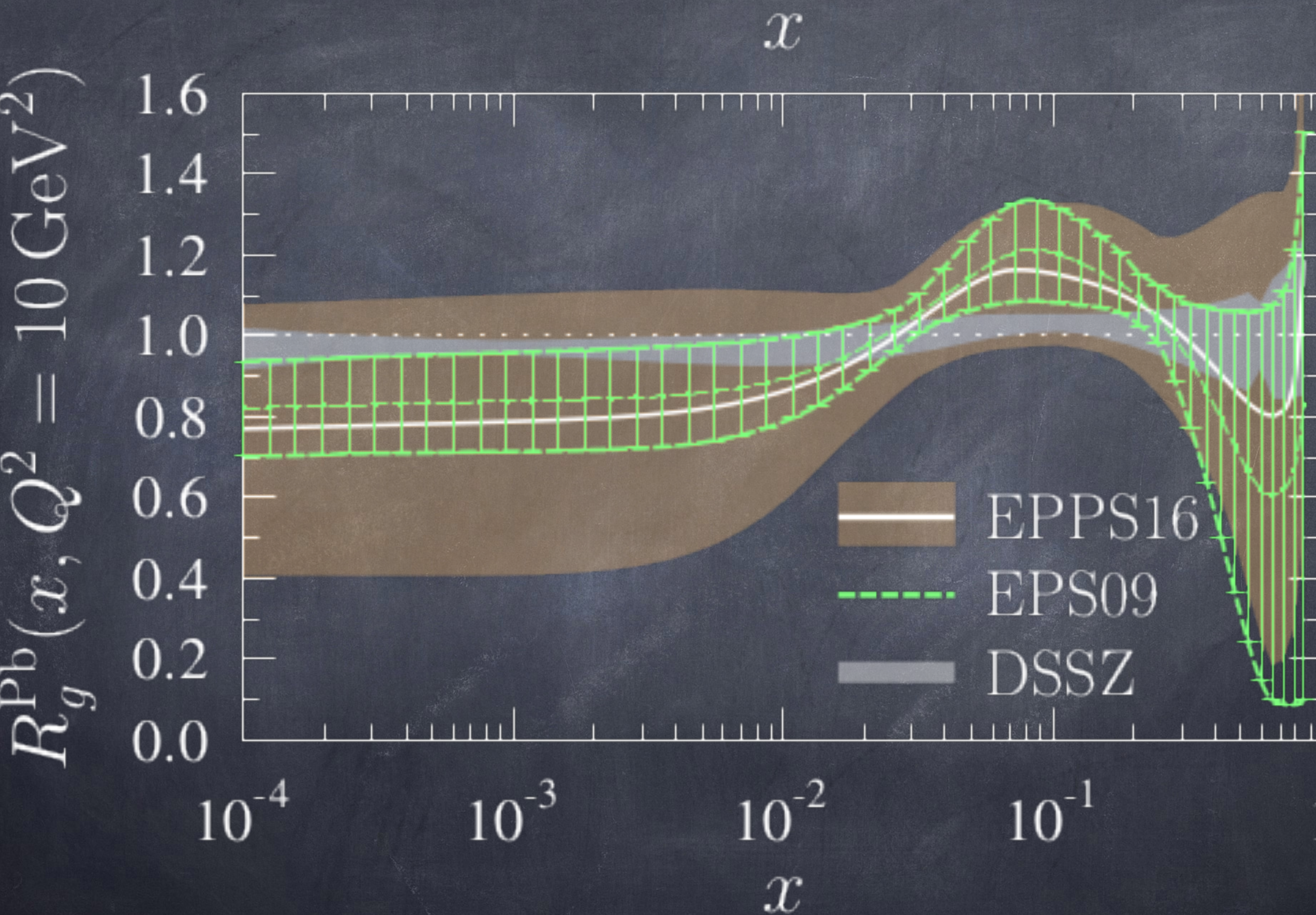
so far, only access to the gluon through scaling violations

a quick reminder

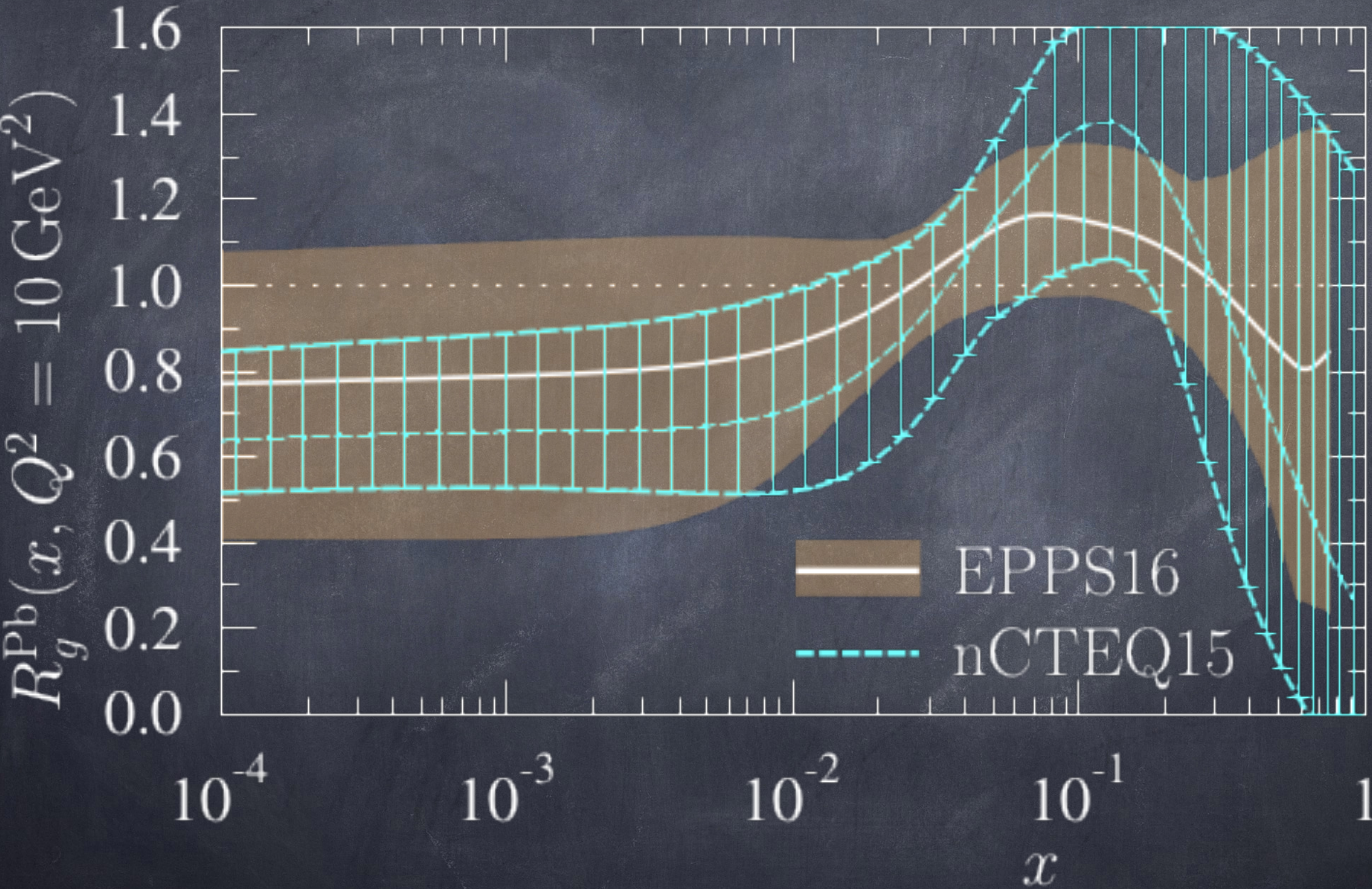
# before an EIC




before an EIC



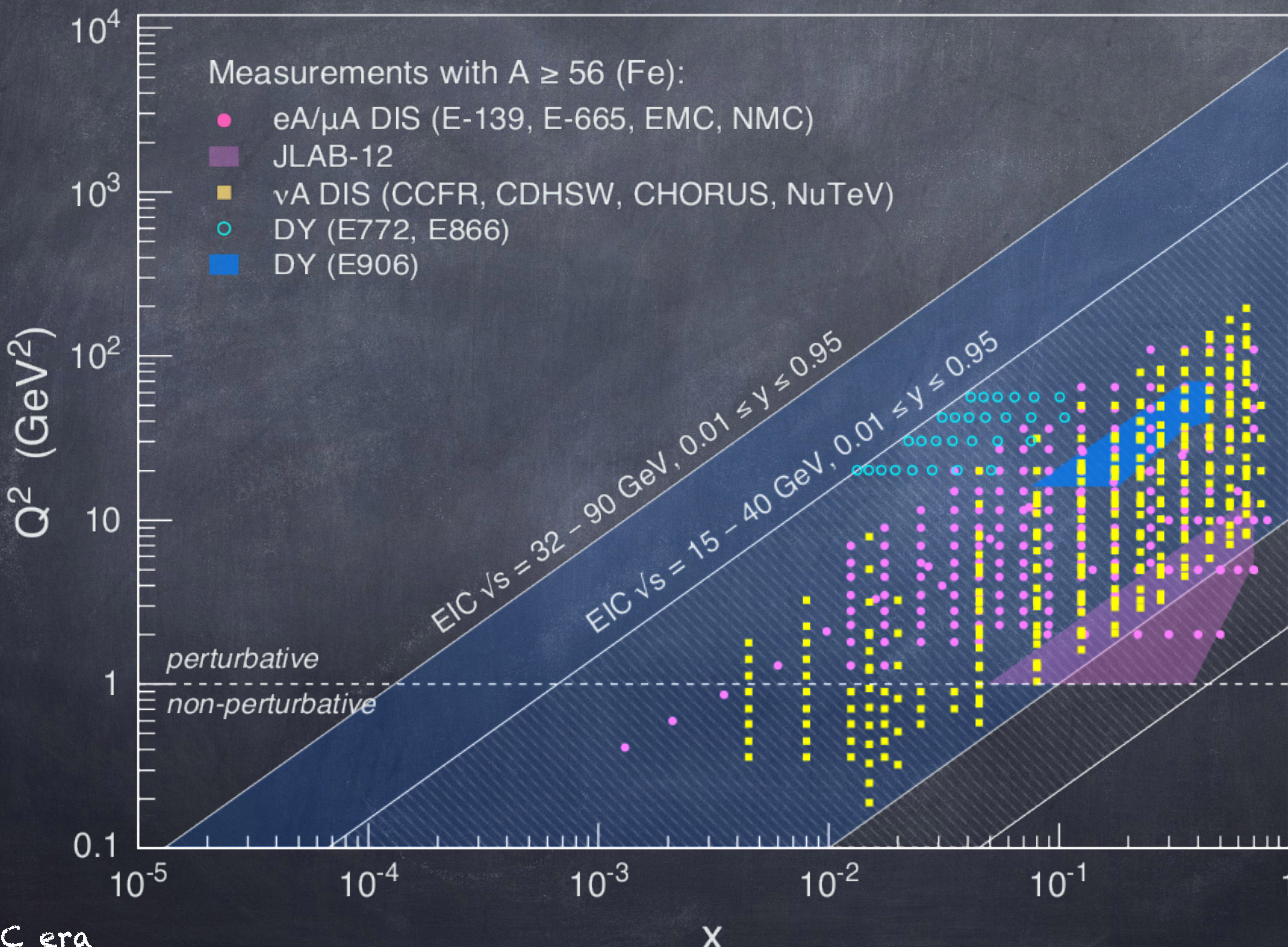

before an EIC




before an EIC

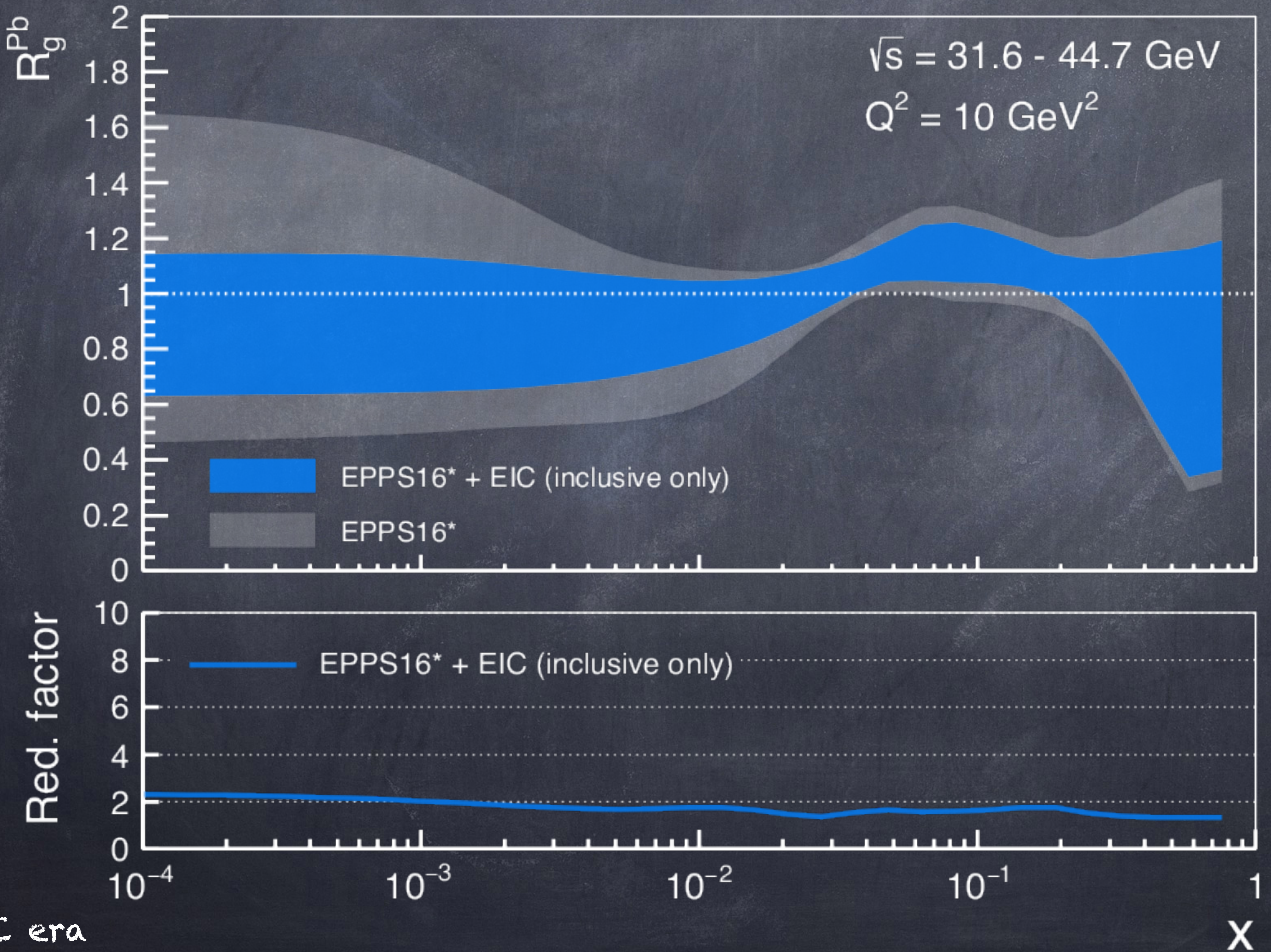
# the EIC era

# two possibilities for the energy range:

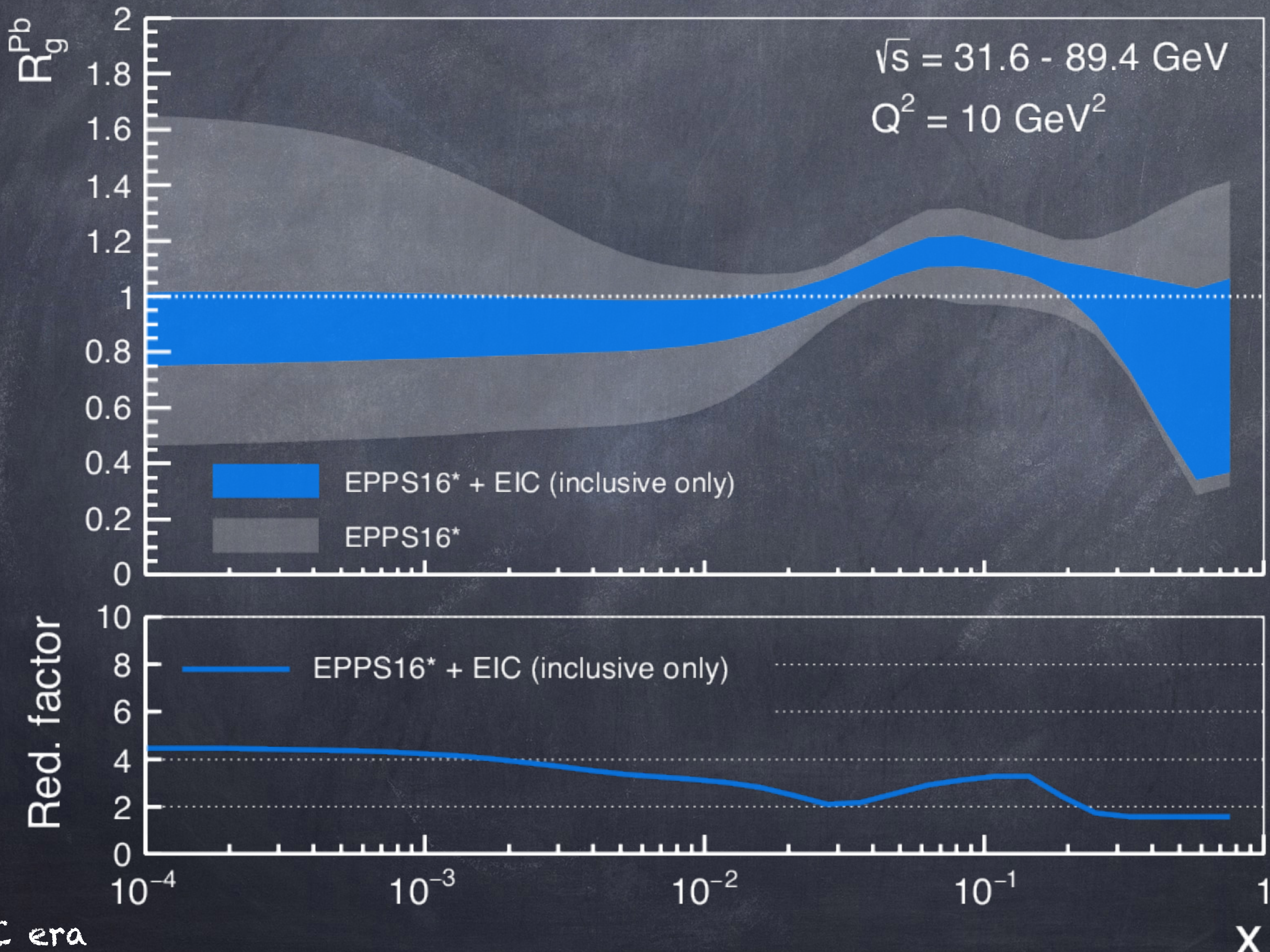



the EIC era

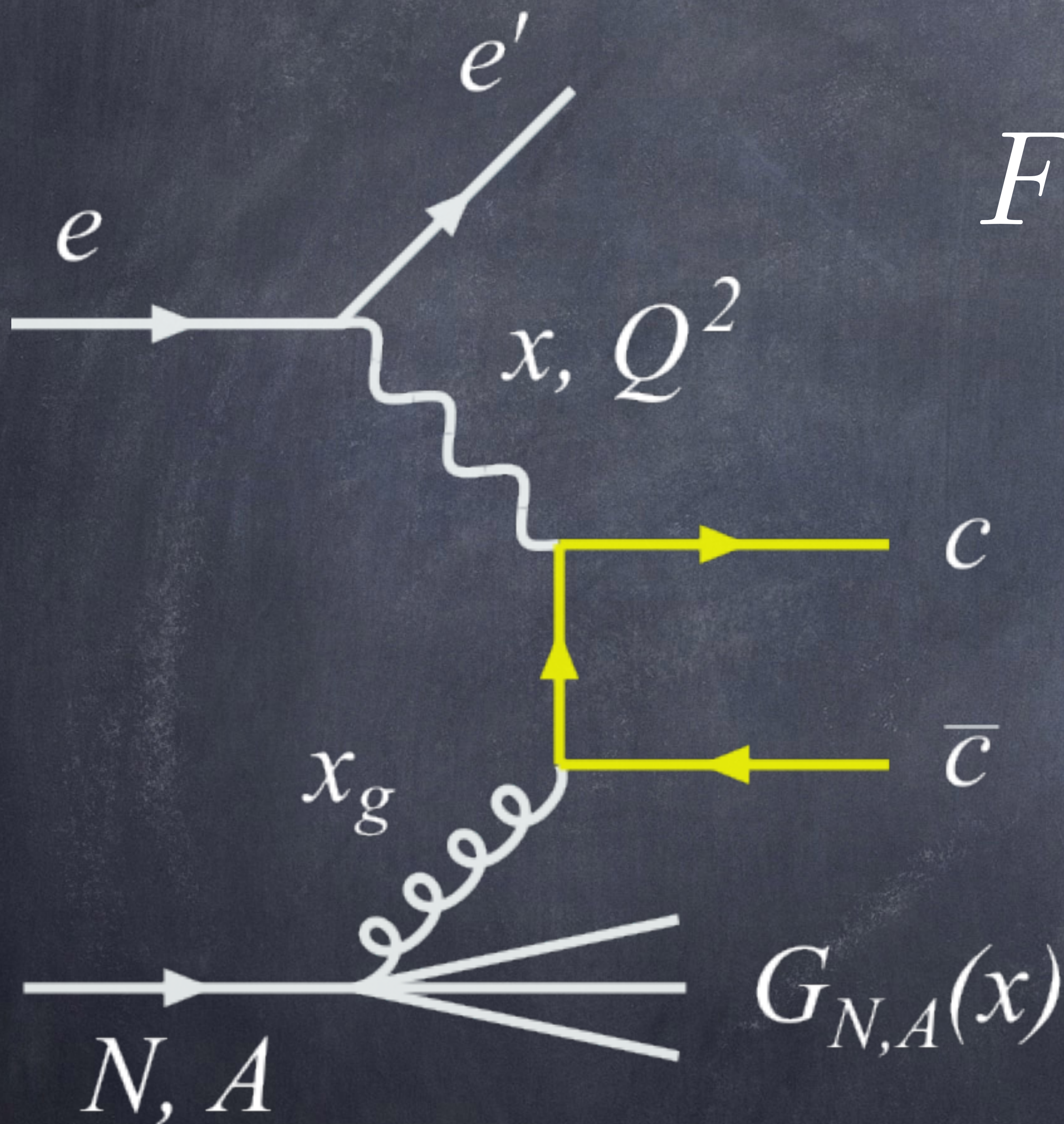
# with a lower energy realization of an EIC



# with a higher energy realization of an EIC



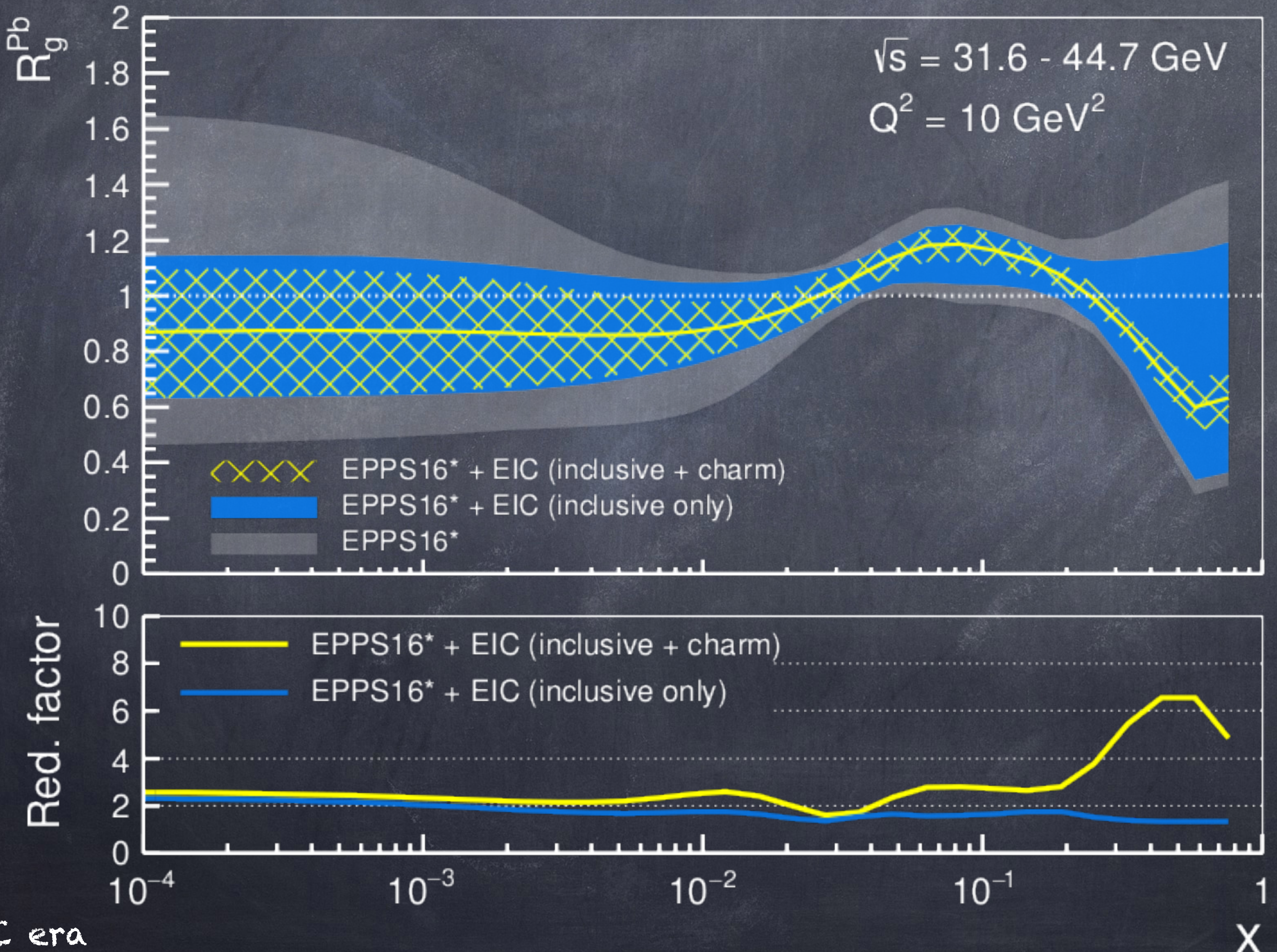
# but if we're charming...



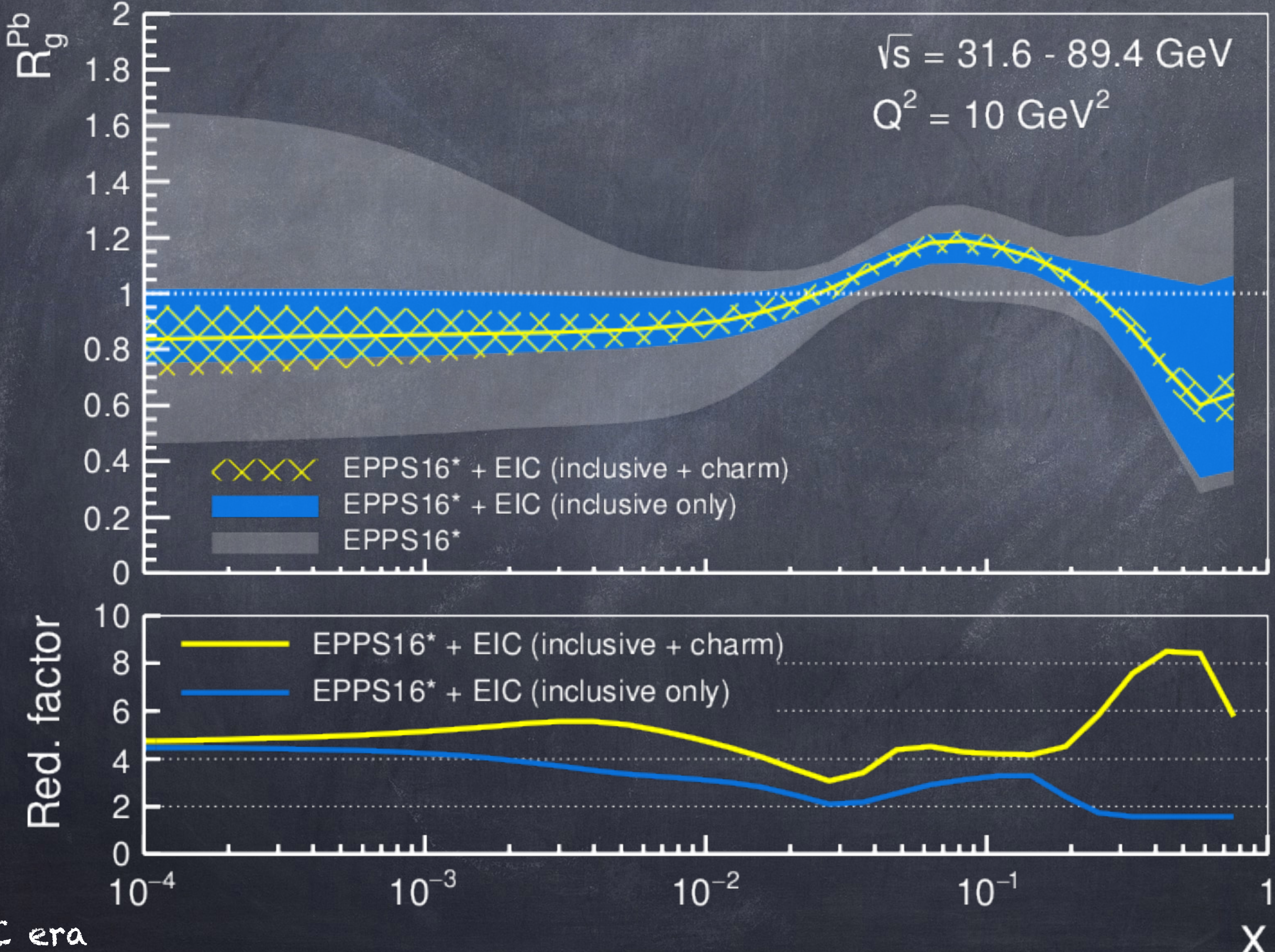

$$F_{2,LO}^{c\bar{c}} = \frac{\alpha_s Q^2 e_c^2}{4\pi^2 m_c^2}\, g \otimes C_{2,g}^{(0)}$$

$$x < x_g$$

# with a lower energy realization of an EIC



# with a higher energy realization of an EIC



# summary

- nuclear gluon density mostly unconstrained
- an EIC is a must
- low energy:
    - kinematical range not very extended 👎
    - but high precision data 👍
- high energy:
    - kinematical range extended 👍
    - more chances of finding saturation 👍
- for charm: win-win situation 👍